US Army Corps of Engineers®
Engineer Research and Development Center

CRREL Ice Engineering Research Area

Purpose

The Ice Engineering Research Area is a huge clear-span refrigerated room where large-scale physical models of sections of rivers, lakes, and flow control structures are built and operated at low temperatures. It is the most versatile portion of the Ice Engineering Facility at the Cold Regions Research and Engineering Laboratory. Models of reaches can be constructed to test ways to alleviate ice jams through channel modification. Tests of the bearing capacity of large ice sheets and cold-testing of vehicles and structures are a few of the other potential uses of this space.

CRREL's Ice Engineering Facility is a unique research and testing complex; there is no equivalent facility in the world. At the IEF, the impacts of ice on civil works flood control and navigation structures and waterways are studied in three separate areas: the test basin, the flume, and the research area. Refrigeration systems and computerized data acquisition systems provide state-of-the-art operation and capability, and separate temperature controls allow independent operation of each area.

Specifications

- 80 × 160-ft (24 × 49-m) clear-span refrigerated room
- Room temperature can be maintained down to –20°F (–29°C).
- Floor holds up to 400 lb/ft^2 (1950 kg/m^2)
- Water is recirculated through the model by pumps with capacities of 1, 2, 4, and 8 ft^3/s (0.03, 0.06, 0.11, and 0.23 m^3/s). The 1- and 4-ft^3/s pumps can simulate a stage hydrograph.

The IEF Research Area is an immense hydraulics room where detailed large-scale models of rivers and lakes can be built to simulate natural conditions.

Benefits

The IEF Research Area allows the simulation of natural winter conditions in lakes and rivers so researchers can model and test ways of alleviating ice jams and investigate ice navigation. Ice–structure interactions, water control structures, improved means of ice passage, and the efficiency of equipment at cold temperatures can be studied under controlled conditions and throughout the year. Tests conducted in this room help to alleviate much of the flooding caused by ice jams.

Success Stories

One of the techniques used to minimize ice-jam-related floods in metropolitan areas is to capture the ice upstream of the town in a flood plain. A model study of the Lamoille River in Hardwick, Vermont, resulted in the construction of the ice control structure shown here.

A physical model of Cazenovia Creek in New York State was constructed to optimize the configuration of an ice control structure and to quantify design loads for the structure. The results of the simulations of Cazenovia Creek were validated by field and physical model measurements and helped find a low-cost way to control the creek's ice jams.

Transit time through a lock during the colder period of the year is increased when ice impedes lock operation. In this model study of the navigation locks in Sault Sainte Marie, Michigan, the bubbler screens and lock filling sequences are being evaluated to manage the ice and reduce lockage times.

Point of Contact

Leonard Zabilansky at (603) 646-4319 or by email at Leonard.J.Zabilansky@erdc.usace.army.mil.